



<u>SOIL NAIL WALL DRAWING INDEX</u>	
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1. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS PROVIDED IN THE DOCUMENT M 41-10 2018 WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (AMENDED 01-07-2019) FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION. WHERE CONFLICTS OCCUR, THE STANDARD SPECIFICATIONS SHALL PREVAIL.
2. THE SOIL NAIL WALL STRUCTURES HAVE BEEN DESIGNED IN ACCORDANCE WITH THE PROCEDURES CONTAINED
 - a) WSDOT GEOTECHNICAL DESIGN MANUAL (GDM) M46-03.11 MAY 2015 AND ADDENDUM M46-03.12 REVISIONS CHAPTERS 6 AND 15
 - b) WSDOT DESIGN MANUAL M22-01.18 DECEMBER 2019 AND M22-01.05 JUNE 2009
 - c) FEDERAL HIGHWAY ADMINISTRATION (FHWA) PUBLICATION "SOIL NAIL WALL REFERENCE MANUAL – ENGINEERING CIRCULAR NO. 7 (PUBLICATION NO. FHWA-NHI-14-007)
3. REFERENCE MATERIALS:
 1. "GEOTECHNICAL ENGINEERING REPORT, WALL 7.15R" PREPARED BY WOOD ENVIRONMENTAL AND DATED 10-01-2020
4. SOIL NAIL DESIGN PARAMETERS (PER REFERENCE 2 ABOVE):

SOIL/ROCK TYPE	FRICTION ANGLE (DEGREES)	COHESION (PSF)	UNIT WEIGHT (PCF)	SHORING SURCHARGE (PSF)	DESIGN LOAD TRANSFER (DL) SOIL/GROUT BOND *
ESU #1A (EMBANKMENT FILL)	34	0	115	250	.85  

5. THIS DESIGN ASSUMES THAT THE WORKMANSHIP EMPLOYED WILL BE OF THE HIGHEST QUALITY AND THAT THE CONTRACTOR WILL BE DIRECTLY RESPONSIBLE TO THE DESIGN ENGINEER. THEREFORE, THIS DESIGN IS ONLY VALID IF CONSTRUCTED BY DRILL TECH DRILLING & SHORING, INC.
6. THE DESIGN LIFE FOR THE TEMPORARY SOIL NAIL WALL IS 3-YEARS OR LESS, AS DEFINED PER GDM 15-7.3.3
7. A MONITORING PLAN WILL BE PROVIDED UNDER A SEPARATE COVER.
8. THERE WILL BE NO UNUSUAL HEAVY CONSTRUCTION EQUIPMENT (CRANES OR LARGE EQUIPMENT) OR MATERIAL LOADS ABOVE THE TEMPORARY SOIL NAIL WALL. PER GDM 15-4.9 "SURCHARGE LOADS" AND GDM 15-7.3.3, THE REQUIRED SURCHARGE LOADING OF 250 PSF LIVE LOAD WAS INCLUDED IN THE DESIGN TO ACCOUNT FOR THE EXISTING TRAFFIC LOADS AND "ROUTINE CONSTRUCTION EQUIPMENT". THEREFORE, THE WALL CANNOT BE LOADED ABOVE STANDARD HIGHWAY LOADING.
9. TO THE BEST OF THE DESIGNERS KNOWLEDGE AT THIS TIME BASED ON THE SCOPE OF WORK, THE TEMPORARY SHORING SYSTEM (SOIL NAIL WALL) WILL NOT INTERFERE WITH FUTURE CONSTRUCTION FOR THIS PROJECT, WILL NOT IMPEDED THE FLOW OF GROUNDWATER, CREATE A HARD SPOT, OR CREATE A SURFACE OF WEAKNESS REGARDING SLOPE STABILITY.

1. EXCAVATION SHOULD BE PERFORMED TO THE LINES AND GRADES SHOWN ON THE PROJECT GRADING PLANS.
2. MAX VERTICAL CUT FOR SOIL NAIL LIFTS SHALL NOT EXCEED 6'

1. NAIL GROUT: $f_c = 4,000$ PSI MIN. PER SECTION 9-20.3(4) WSDOT 2018 SPECIFICATIONS
2. NAIL BARS: BARE BAR GRADE 75 #7 ALL-THREAD BARS (ASTM A615)
3. LAYOUT OF SOIL NAILS IS AS SHOWN. ADJUSTMENTS MAY BE MADE PER WSDOT SECTION 6-15.3(6) TO ACCOMMODATE FIELD CONDITIONS AS APPROVED BY THE ENGINEER. ADJUSTMENTS OF UP TO 6 INCHES ON ISOLATED NAILS MAY BE MADE WITHOUT NOTIFYING THE ENGINEER. NAIL INCLINATION MAY BE CHANGED IN THE FIELD UP TO 3 DEGREES. LAYOUT LINES ARE BASED ON THE REFERENCED GRADING PLAN.
4. SPACING OF SOIL NAILS SHALL NOT BE CLOSER THAN 3 FEET IN ANY DIRECTION, SPACING OF SOIL NAILS SHALL NOT BE GREATER THAN 8 FEET IN VERY DENSE GLACIALLY OVER CONSOLIDATED SOILS, OR 6 FEET FOR OTHER SOIL TYPES IN THE HORIZONTAL AND VERTICAL DIRECTION.
5. DRILLING FOR SOIL NAILS SHALL NOT COMMENCE UNTIL ALL EXISTING UTILITIES IN THE SOIL NAIL ZONE HAVE BEEN LOCATED AND POTENTIAL CONFLICTS RESOLVED.
6. NAILS IN A GIVEN VERTICAL SECTION SHALL BE INSTALLED ACCORDING TO THE TYPICAL SECTION, DESIGN SCHEDULE, AND THE REFERENCED DETAILS.
7. ALL TEST NAILS ARE SACRIFICIAL. TOTAL LENGTH OF THE TEST SOIL NAIL ASSEMBLY EQUALS EMBEDMENT LENGTH PLUS EXTRA LENGTH REQUIRED FOR JACKING EQUIPMENT.

1. REINFORCED SHOTCRETE: fy = 60,000 PSI (REBAR PER AASHTO M31/ ASTM A706) PER WSDOT 9-07.2
fy = 60,000 PSI MIN PER WSDOT 9-07.7
fc = 4,000 PSI (28-DAY SHOTCRETE COMPRESSIVE STRENGTH) PER WSDOT SECTION 6-18.2
2. CEMENT AND AGGREGATE FOR SHOTCRETE SHALL CONFORM WSDOT SECTION 6-18.2
3. SHOTCRETE TESTING AND TEST PANEL REQUIREMENTS SHALL BE PER WSDOT SECTION 6-18.3(3)
4. MINIMUM LAP SPLICE OF STEEL REINFORCEMENT SHALL BE AS FOLLOWS: REBAR: 48 BAR DIAMETERS
WWF: 2 SQUARES
5. GEOCOMPOSITE DRAIN BOARDS SHALL BE SECURED TO THE SLOPE/BACKFILL IN SUCH A MANNER THAT PREVENTS FROM GETTING BETWEEN THE CUT SLOPE/BACKFILL AND THE GEOCOMPOSITE DRAIN.
6. GEOCOMPOSITE DRAIN SHALL BE PER WSDOT SECTION 9-33.2(3).

1. ALL SOIL NAIL VERIFICATION AND PROOF TESTING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS PROVIDED IN THE DOCUMENT M 41-10-2018 WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (AMENDED 01-07-2019) FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION. IN PARTICULAR SECTION 6-15.3(8).

1. FOR SHOTCRETE METHODS AND EQUIPMENT, REFER TO FLJV SUBMITTAL 0470
2. FOR SOIL NAIL WALL CONSTRUCTION PROCEDURES, REFER TO FLJV SUBMITTAL 0477

1. PRIOR TO CONSTRUCTION OF THE SOIL NAIL WALL, AT LEAST ONE TEST PIT IN THE ESU #18 SOILS SHALL BE EXCAVATED TO EVALUATE THE UNSUPPORTED WALL FACING STAND-UP TIME. DUE TO THE RESTRICTED ACCESS ON THE SLOPE, TEST PITS WILL BE EXCAVATED PRIOR TO WALL CONSTRUCTION. IF SOIL CONDITIONS VARY FROM THE SOIL PROPERTIES USED IN DESIGN, CONTACT THE DESIGN ENGINEER TO RE-EVALUATE THE WALL DESIGN. OBSERVATION OF THE SOIL CONDITIONS IN THE TEST PITS AND STANDUP DURATION WILL BE A CONSTRUCTION HOLD POINT.

2. THE TEST PIT WILL BE CONSTRUCTED AS FOLLOWS:

- 1) DEPTH OF TEST PIT SHALL BE AT LEAST TWICE THE VERTICAL NAIL SPACING
- 2) LENGTH OF TRENCH BOTTOM SHALL BE AT LEAST ONE AND A HALF TIMES THE EXCAVATION DEPTH
- 3) TEST PIT SHALL REMAIN OPEN AT LEAST 24 HOURS AND SHALL BE MONITORED FOR SLOUGHING, CAVING, AND GROUNDWATER SEEPAGE
- 4) IF VARIABLE SOIL CONDITIONS ARE PRESENT, A TEST PIT IN EACH SOIL TYPE SHALL BE COMPLETED

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I-405, Renton to Bellevue Widening & and Express Toll Lanes Project

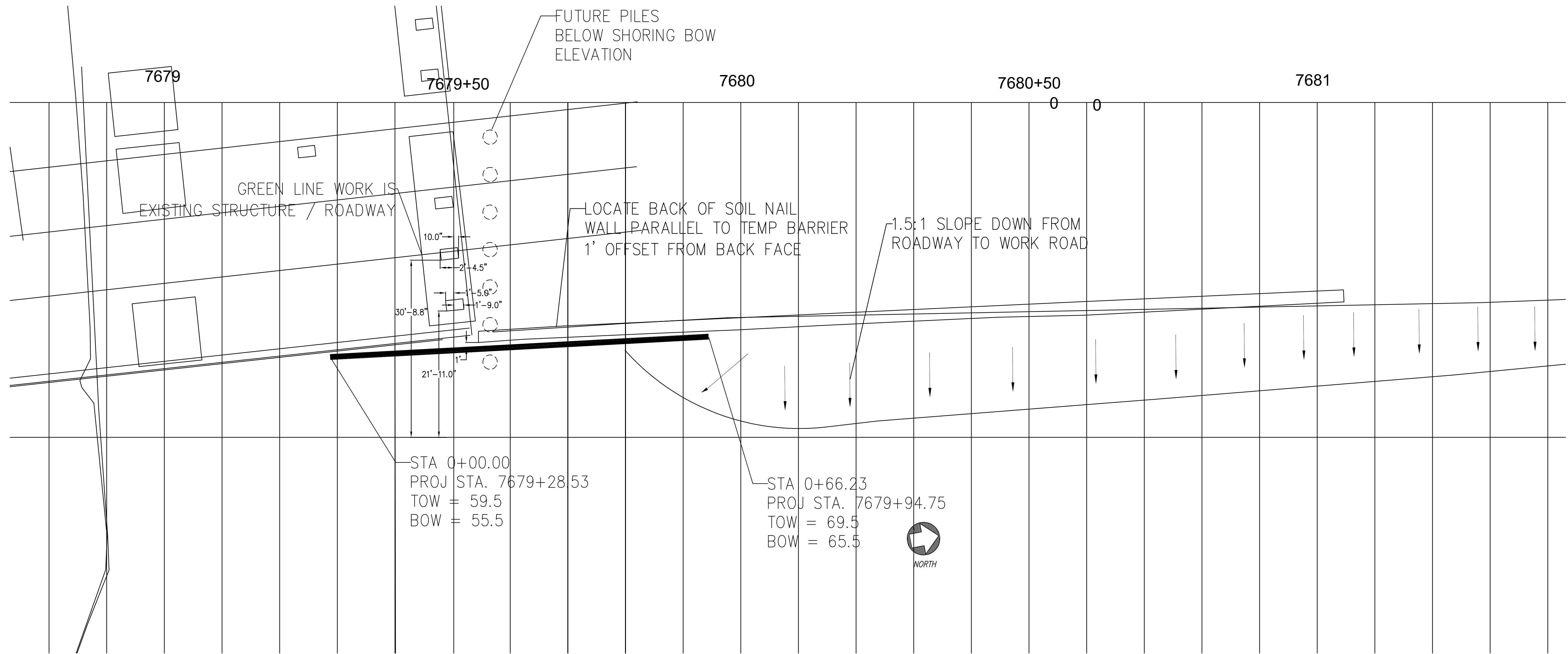
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REVIEWED BY: Todd Wentworth DATE: 6 Jan 22

Geotechnical engineering

Review is for general conformance with contract or design documents. Sole responsibility for correctness of dimensions, details, quantities, materials, and safety during fabrication and erection shall remain with the contractor.

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r1	6/21/2021	RESPONSE TO COMMENTS	S. MCNAMARA	AS SHOWN						
r2	12/8/2021	UPDATED BASED ON VERIFICATION TESTING	CHECKED BY:	JOB NUMBER:			12/8/21	SOIL NAIL WALL NOTES	SHEET	OF
			K. ARNT	20018						
			DATE:	DRAWN BY:						
			12/8/2021	S. MCNAMARA			1	4		



1 SOIL NAIL WALL – PLAN VIEW
SN2 SCALE AS SHOWN



NOTES:
1) TSNW LAYOUT LINE (LOL) CAN DEVIATE FROM STRAIGHT LINES SHOWN BY UP TO 2' TO MATCH EXISTING FIELD CONDITIONS.

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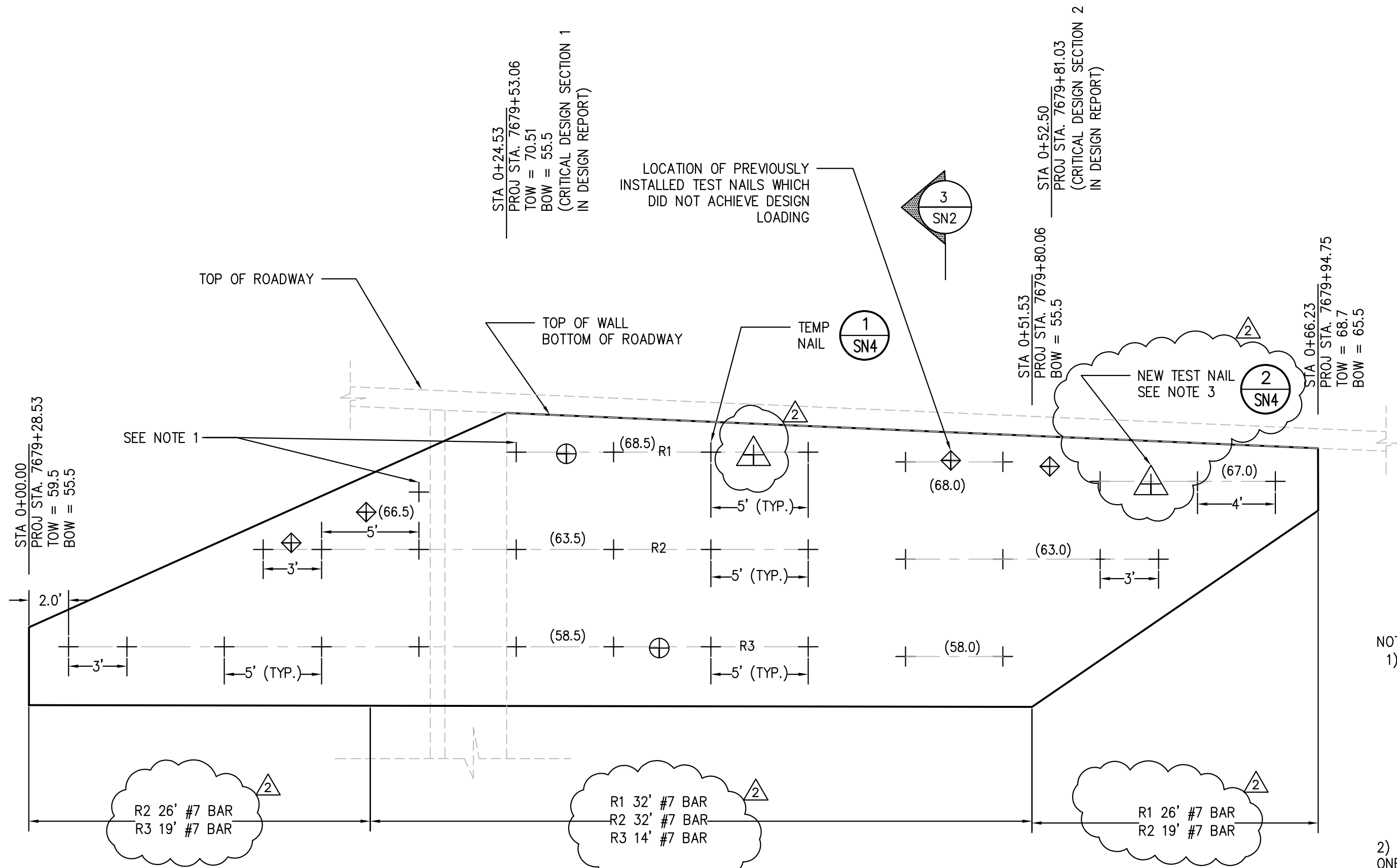
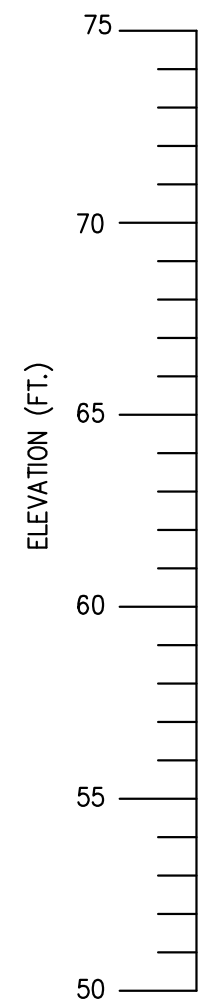
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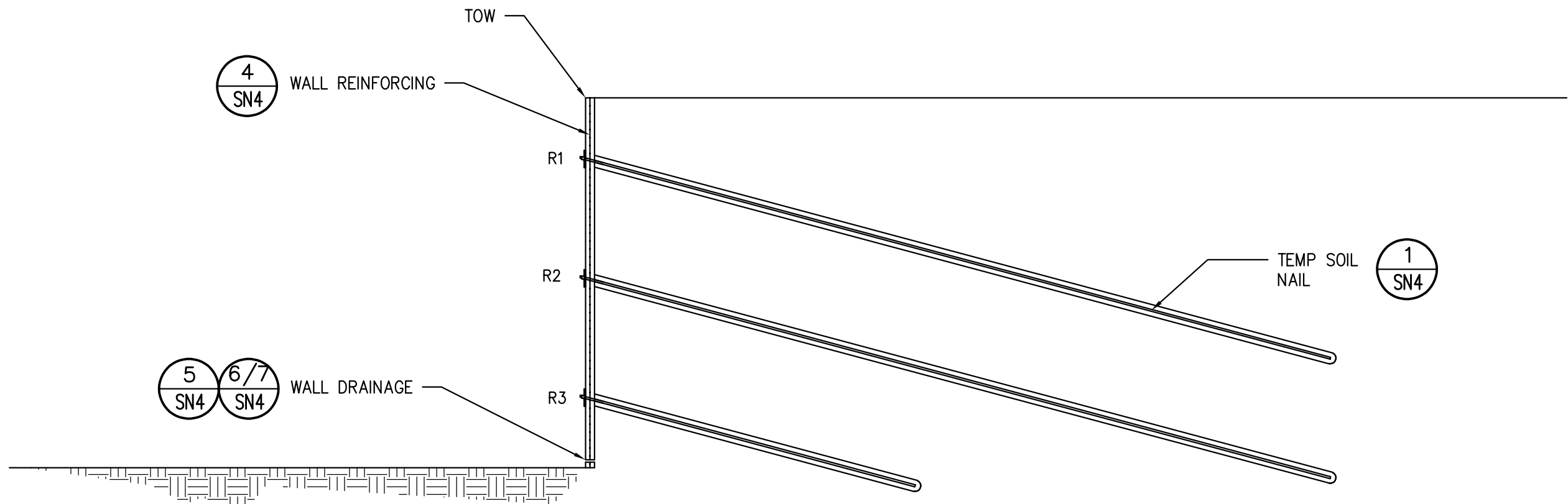
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			DATE: 12/8/2021	DRAWN BY: S. MCNAMARA			SHORING ELEVATIONS AND X-SECTIONS		<table><tr><td>SHEET</td><td>OF</td></tr><tr><td>2</td><td>4</td></tr></table>	SHEET	OF	2
SHEET	OF											
2	4											



1 TEMPORARY SOIL NAIL WALL – ELEVATION
SCALE AS SHOWN

- NOTES:
- 1) THE 6 EACH NAIL LOCATIONS (3 IMMEDIATELY TO THE NORTH AND 3 IMMEDIATELY TO THE SOUTH) ADJACENT TO THE EXISTING BRIDGE ABUTMENT WALL MAY BE ADJUSTED AS NECESSARY TO FACILITATE INSTALLATION. IN GENERAL:
A) ADJUSTMENTS OF NAIL LOCATION OF UP TO ONE FOOT HORIZONTAL AND VERTICAL.
B) NAIL INCLINATION MAY BE CHANGED IN THE FIELD UP TO 5 DEGREES.
C) NAIL SPLAY WITH RESPECT TO THE WALL FACE MAY BE ADJUSTED UP TO 15 DEGREES.
 - 2) LOCATIONS OF PROOF AND VERIFICATION NAILS MAY VARY UP TO ONE FOOT TO ACCOMMODATE AS- BUILT FIELD CONDITIONS.
 - 3) 2 EACH NEW PRE-PRODUCTION VERIFICATION NAILS WILL BE INSTALLED AND TESTED TO 200% OF DLT VALUE. PROOF TEST NAILS WILL BE INSTALLED DURING PRODUCTION.



3 SOIL NAIL WALL – TYPICAL CROSS SECTION
SCALE AS SHOWN

LEGEND	
+	TEMPORARY SOIL NAIL
△	NEW VERIFICATION TEST SOIL NAIL
⊕	PROOF TEST SOIL NAIL
◆	PREVIOUSLY DESIGN TEST NAILS
STA.	WALL STATIONING
TOW	TOP OF WALL
BOW	BOTTOM OF WALL
FG	FINISHED GRADE
(XX.XX)	NAIL ELEVATION



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			DATE: 12/8/2021	DRAWN BY: S. MCNAMARA						3	4



* BASED ON 10' BONDED LENGTH. IF AS-BUILT BONDED LENGTH DIFFERS FROM THIS VALUE, THE ENGINEER SHALL BE NOTIFIED AND WILL MODIFY THE TEST LOADS.

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